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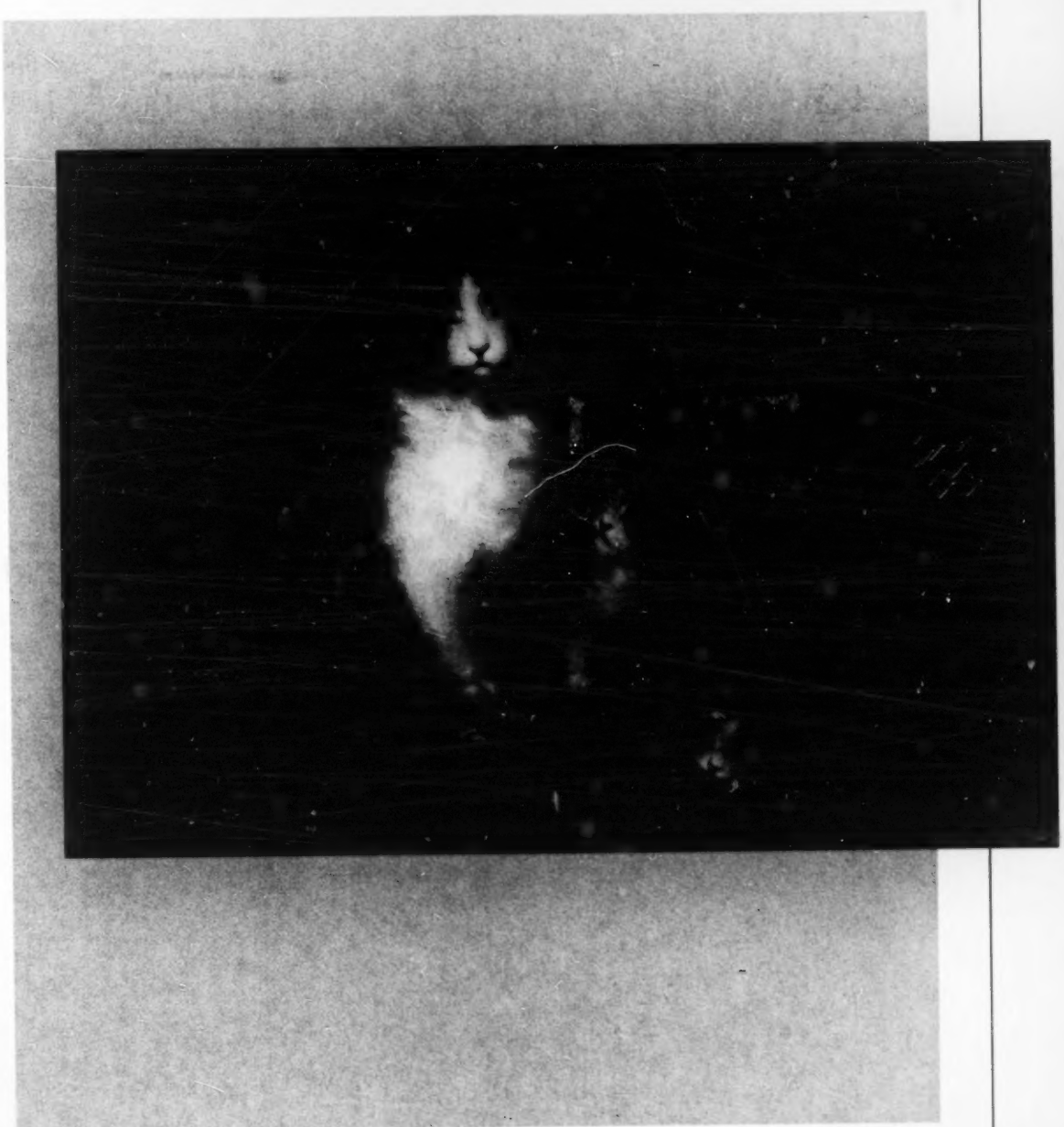

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VBPA

Special Report

Clinical clerkship curricula at United States and Canadian veterinary schools

Anthony Schwartz, DVM, PhD, and Élaine Bell, MA

Many of the veterinary schools in the United States and Canada are planning, and a few already have made, major changes in their curricula. In many cases, the movement toward change arose from institutional involvement in the Pew National Veterinary Education Program.[1] Curricular deliberations at these institutions have included a variety of questions, such as: Should partial or total clinical species tracking be initiated, that is, should education focus only or mainly on the species a student plans to serve in practice? Is there a need to expose all students to a prescribed core of knowledge, to assure qualification to enter any field of veterinary medicine upon graduation? Should problem-based learning be a major part of new curricula, replacing or augmenting lectures? Is there a need for fewer core and more elective/emphasis courses? Should there be more clinical education and less basic science didactics? Should hands-on clinical education begin earlier than in the current curriculum?

Asking similar questions, Tufts University School of Veterinary Medicine is considering changes in its curriculum. This report was developed because we wished to provide our Curriculum Committee with data pertaining to clinical clerkships (rotations—*see* Materials and Methods) at other veterinary schools. This led us to survey the other 30 institutions in the United States and Canada.

On the basis of internal needs, our initial interest mainly was on large animal clinical clerkships. As our study proceeded, however, many institutional respondents to the survey showed substantial interest in data concerning all clerkships. This led to a broadening of the goals of the study and an inclination to publish our findings for use by other educators dealing with similar questions at their institutions. We trust that this report will also be of interest to private practitioners and to students considering careers in veterinary medicine, as it shows the substantial diversity of veterinary curricula and the degree to which changes are afoot in contemporary clinical education.

From the Office of the Associate Dean, Clinical Education and the Department of Surgery, School of Veterinary Medicine, Tufts University, 200 Westboro Rd, North Grafton, MA 01536.

The authors thank the institutional representatives for their time and effort in providing information concerning their institutions' programs and plans.

Definitions

Clerkships are predominantly clinical rotations normally associated with fourth-year veterinary professional education, in which students have primary case management responsibilities under supervision of the clinical faculty. We extend the definition to include nonclinical practice rotations designed to provide exposure to other niches into which graduates might fit, for example, government, industry, and research.

Core clerkships are defined as those required of all veterinary students.

A *full tracking curriculum* is one in which there may be no core, or a core of only one or a few specific clerkship weeks, usually in one or more of the support disciplines (eg, radiology, anesthesiology, or pathology), associated with a requirement that students participate in one of a menu of species or other tracks, which prescribes the rest of the curriculum.

A *modified tracking curriculum* has a limited but more extensive and broad-based required core than does a full tracking curriculum. Modified tracking exposes students to clerkships dealing with multiple species and is associated with requisite participation in one of a menu of species or other tracks, which prescribes the rest of the curriculum.

Track-specific core clerkships are those required only of students participating in a formal track.

Electives are those clerkships in which students choose from a broad range of options, usually without any specific curricular goals.

In *selectives* (*restricted electives* at some institutions), students choose from a restricted list of options, usually with a specific curricular goal in mind.

Internal elective clerkships are available only within the institution.

Externships are external electives, that is, those that are available outside the institution, such as at

private veterinary practices (we do not differentiate between more formally regulated externships, sometimes called preceptorships, and less regulated externships).

Required electives are those that are mandated for all students within the institution. In certain instances, these may be required between the third and fourth years of the curriculum.

Optional electives are those that the student may decide to use not for a clerkship, but for vacation or travel to a distant elective site (these may be taken during the school year and/or between the third and fourth years of the curriculum).

In the tables, for the sake of uniformity, in certain cases we have used a title that is different from that used at a specific institution, but which implies the same content stated by the institution. For example, pathology clerkships include anatomic pathology (necropsy and histology) and clinical laboratory (clinical pathology) exposure, but cannot readily be separated into the two discrete components. Specific institutional clerkship content may be stated by notation in the table legends.

The survey—Starting in late 1990, telephone dialogues were initiated with one or more institutional representatives, eventually including all United States and Canadian veterinary schools. Information was obtained about the number of weeks (one week of half-day exposure was considered one half week) of various clinical clerkships, as well as changes planned in the clerkship curriculum. First a summary of the information, and later a draft of the manuscript, was distributed to at least one institutional representative for comments and necessary changes.

Tabulated data include only weeks of clerkships required of every student at the listed institution, plus the minimum number of weeks of optional electives available to all students. If tracking or emphasis areas exist beyond a core, only the core is described in detail. All listed clerkships take place in the fourth year, unless otherwise stated. All data and programmatic changes provided are current as of August, 1991.

The data reflect only discrete periods formally restricted to the listed clerkship subject. At times, this involves two or more formal subrotations within a clerkship, both of which are listed in the tables. For example, the institutional curriculum may list only small animal surgery as the clerkship, but if each student is required to spend defined periods in soft tissue surgery and orthopedic surgery, the two subrotations are listed. In contrast, if, for

Table 1—Required large animal clerkships at United States and Canadian veterinary schools

Institution	Clerkship (weeks)															
	LAC	LAS	LAM	LAEM	LAFS	EQC	EQS	EQM	EQFS	FAC	FAS	FAM	FAFS	HH	TH	Other	Total
Auburn						4			1	5			2.5		2.5		15
California																	0*
Colorado		2		1				1	1			2		1			8
Cornell		4	2		4												10
Florida		4	4										2		2		12
Georgia			[illegible]		2†		2.5				2.5			2†	2†		14
Guelph		2	2											4	1		9
Illinois					3	3				3							9
Iowa					2		2	2		2					2		10
Kansas							3	3		6						1‡	13
Louisiana					2		3	2		2				1			10
Michigan							2	2		3			3				10
Minnesota		3	3		3										3		12
Mississippi	4					6§				6§							16
Missouri						8				4			4		4		20
Montreal					2		2	2		3				1	2		12
N Carolina						4				4				4			12
Ohio					3.33		1.67	1.67		3.33				3.33			13.33
Oklahoma						2				2							4
Oregon		4	3										4				11
Pennsylvania		4	4		2												10
Pr Ed Island																	0‖
Purdue																	0*
Saskatchewan		4	2		2												10
Tennessee		4	4		4									1		3¶	16
Texas					2		2	4		2				2	4		16
Tufts		4	4		4												12
Tuskegee	4				4												8
Va-Md	3				3												6
Washington		4	4											6		1#	15
Wisconsin		2	4		2										2		10

*Tracking curriculum, with all required large animal clerkships in relevant tracks only. †Students may select all three marked programs at two weeks each, or two of three programs at three weeks each. ‡Meat Animal Research Center. §Third-year rotation. ‖Totally elective, nontracking clerkship curriculum. ¶Divided among large animal anesthesia, neonatal intensive care, and ambulatory (LAFS). # *Selective:* Large animal medicine, large animal surgery, or large animal anesthesiology.

LAC = large animal clinics (surgery/medicine); LAS = large animal surgery; LAM = large animal medicine; LAEM = large animal emergency medicine; LAFS = large animal field service/ambulatory; EQC = equine clinics (surgery/medicine); EQS = equine surgery; EQM = equine medicine; EQFS = equine field service/ambulatory; FAC = food animal clinics (surgery/medicine); FAS = food animal surgery; FAM = food animal medicine; FAFS = food animal field service/ambulatory; HH = herd health/population medicine; TH = theriogenology.

Table 2—Required small animal clinical clerkships at United States and Canadian veterinary schools

Institution	Clerkship (weeks)									
	SAC	SAS	ORT	GST	SAM	ICU	EM	OPR	Other	Total
Auburn			2.5	2.5	3.3			2.5		10.8
California										0*
Colorado			2	2	2	1	1			8
Cornell			2	2	3			1		8
Florida			2	2	4					8
Georgia			3	3	4			3		13
Guelph		2			2	1				5
Illinois		3			3					6
Iowa			2	2	4	2				10
Kansas			3	3	4			2		12
Louisiana			2	2	5					9
Michigan			2	2	2	2		2		10
Minnesota		3			6					9
Mississippi	4	4†			4†	4†	2			18
Missouri			4	4	8					16
Montreal		2			2					4
N Carolina			2	2	4					8
Ohio			1.67	1.67	3.33	1.67	‡	1.67		10
Oklahoma		2			2	2		2		8
Oregon			1.5‡	1.5‡	2‡			1‡		6†
Pennsylvania			2	2	4	1	2			11
Pr Ed Island										0§
Purdue										0*
Saskatchewan		4			4					8
Tennessee			2	2	4					8
Texas		8‖			8¶					16
Tufts			2	2	4	4				12
Tuskegee		2.67			2.67			2.67		8
Va-Md		3			3					6
Washington			2	2	2		1	2	1#	10
Wisconsin		2			2					4

*Tracking curriculum, with all required small animal clerkships in relevant tracks only. †Third-year rotations. ‡Students in ophthalmology and radiology work double shifts, yielding a total of one week's nonscheduled exposure to emergency medicine service. §Totally elective, but nontracking clerkship curriculum. ‖All students take two weeks of general small animal surgery; they must also *select* three of the following rotations of 2 weeks each: orthopedic surgery, neurosurgery, soft tissue surgery, or ophthalmology. ¶*Selective;* students must complete four of the following five rotations of two weeks each: dermatology or neurology, cardiology/internal medicine, oncology/internal medicine, internal medicine, or community practice/exotic animals. #*Selective;* from a list of already completed small animal clerkships.

SAC = Small animal clinics (medicine/surgery); SAS = Small animal surgery; ORT = Orthopedic surgery; GST = General/soft tissue surgery; SAM = Small animal internal medicine or referral practice; ICU = Intensive care unit; EM = Emergency medicine; OPR = Outpatient/receiving or local practice.

example, anesthesia training is part of the surgery clerkship, but there is no defined period set aside for each student exclusively for anesthesia training, there is no subdivision of the clerkship in our tables.

Finally, we present information about existing new curricula as well as planned directions for change in clerkships at the various schools.

Results

Data are presented concerning the number of weeks of required large animal (Table 1), small animal (Table 2), and support, specialty, mixed species, and other (Table 3) clerkships. Table 4 shows required and optional elective clerkships, and Table 5 presents a summary of the data.

Full tracking curricula—The University of California and Purdue University have full tracking curricula.

California has eight available tracks: Mixed Animal Practice; Small Animal Practice; Large Animal Practice; Equine Practice; Food Animal Practice; Zoological Practice; Companion Animal Practice; and Small/Food Animal Practice.

A 36-week clerkship curriculum is available during the fourth year (including an optional elective week). All students in all tracks have three weeks of clerkships in common: a one-week clinical laboratory clerkship and a two-week anatomic pathology clerkship. In addition, all students have at least one week (up to two weeks in some tracks) of large and/or small animal anesthesia training (Table 3). All tracks require medicine and surgery clerkships, with the species dealt with varying with the track, and all but the food animal track require radiology. The track-specific core varies from 18 to 24 weeks.

The rest of the California curriculum consists of required selectives and electives. In three of the tracks, there are no required selectives, whereas two weeks of internal selectives are required in three tracks, and six weeks in two tracks. In the Food Animal and Small/Food Animal tracks, there also is a four- or two-week selective, respectively, consisting of an externship/preceptorship in which students select from a small list of practices. All students have three to 11 weeks of required internal elective clerkships, depending on the track (Tables 4 and 5). Finally, in addition to the one week of optional elective during the academic year, the 12 weeks between third and fourth years may be used for optional internal or external electives, without credit. During the latter period, access to internal optional electives is limited to those clerkships accepting students (Tables 4 and 5).

Purdue has eight available tracks: Mixed Ani-

Table 3—Required support, specialty, mixed species and other clinical clerkships at United States and Canadian veterinary schools and colleges

Institution	Clerkship (weeks)												
	RAD	ANE	PATH	CL	AP	CA	NE	OP	DR	MI	PH	Other	Total
Auburn	2.5	2.5		1.25	1.25		2.5	2.5	1.7				14.2
California		1*		1*	2*								4*
Colorado	2	2			1		1		1			1	8
Cornell	2	2		1	1			2	2				10
Florida	4	2		2	2	2	2	2	2			2	20
Georgia	3	4		1	1								9
Guelph	2	2	2				1					1	8
Illinois	3	3	3			0.75	0.75		0.75			0.75	12
Iowa	2	2		1	1		2			1	1	2	12
Kansas	3	3			1							1	8
Louisiana	5	1	5									2	13
Michigan	2	2		2	2								8
Minnesota	2	3		2	2			1	1	1	1		13
Mississippi	4†	4†	4†									2	14
Missouri	4	4		4	4			2					18
Montreal				3	2			.5	.5		1	1	8
N Carolina	2	2		2	2						4	8#	20
Ohio	2.33	1.67			1.67			1					6.67
Oklahoma	4	4		2	2							1	13
Oregon	1	2‡		1	1			1†		1			7
Pennsylvania	2	2			2	1.2	1.2	.8	2			1.8	13
Pr Ed Island													0§
Purdue				0.5*	1*					0.5*			2*
Saskatchewan	2	4		2	2								10
Tennessee	4	4		2	2		2	2	2			2	20
Texas	3	3		1	2					2	1		12
Tufts	3	3		1	2			1				4#	14
Tuskegee	4			4	4					4			16
Va-Md	3	3		1.5	1.5							3	12
Washington		4						1					5
Wisconsin	1	2			1	1	1	2	1			3#	12

*Tracking curriculum, with all clerkships in this category in relevant tracks only, except as specified in table and text. †Third year rotation. ‡Includes 1 week small animal clerkship in third year and 1 week large animal clerkship in fourth year. §Totally elective, nontracking curriculum; # *selective*.

RAD = Radiology; ANE = Anesthesiology; PATH = Pathology (combined clinical laboratory and anatomic pathology); CL = Clinical laboratory (clinical pathology); AP = Anatomic pathology (necropsy and histology); CA = Cardiology; NE = Neurology; OP = Ophthalmology; DR = Dermatology; MI = Microbiology; PH = Public health/regulatory medicine; Other = A variety of clerkships, as discussed in the text.

mal Practice; Companion Animal Practice; Small Animal Practice; Food Animal Practice (Ruminant Option); Food Animal Practice (Swine Option); Large Animal Practice; Equine Practice; and Nonpractice (eg, Research, Public Health, Regulatory).

The fourth-year curriculum consists of 10 five-week blocks. Of the 10 blocks, seven (five for the Nonpractice track) are required and three (five for the Nonpractice track) are elective (Tables 4 and 5). Included within the required blocks is a 10-week combined two-block program, which includes: a six-week period of required externship (Table 4); the only specific discipline courses common to all tracks, that is, one week of anatomic pathology, and one half week each of clinical laboratory and clinical microbiology (Table 3); and two weeks of optional electives (Tables 4 and 5). All tracks require medicine and surgery clerkships, with the species dealt with varying with the track.

Modified tracking curriculum—At Virginia-Maryland, a basic core of 24 weeks of specific discipline clerkships is required of every student (Tables 1-3). Beyond that, students must track in/emphasize one of five areas: Equine; Food Animal; Small Animal; Mixed Animal; or Government and Corporate (the latter comprises subspecialties, including: Research/Postgraduate; Regulatory/Inspection/Epidemiology; Aquatic/Marine Animal; Zoo/Wildlife; Laboratory Animal/Pathology/Toxicology; and Avian). There are 12 to 15 weeks of track-specific core, varying with the track, exclusive of required elective and externship weeks. The number of weeks of required electives varies from 9 to 12, including 0 to 3 weeks of externship and 6 to 12 weeks of unspecified ("Any" in the tables) electives, depending on the track (Tables 4 and 5).

Fully elective curriculum—The University of Prince Edward Island (PEI) has no core clerkship requirements—only 30 weeks of electives. The content of the elective period is totally up to the student, as long as at least 27 weeks of internal clerkships are chosen (Table 4). Tracking or emphasis is not specified, but is allowed.

Prefourth-year clerkships—Many schools offer minor clinical exposure, without primary patient care responsibilities, to students during their third and sometimes their second or first years. With the few exceptions to be described, formal clinical clerkships, with primary patient care responsibilities, are available only during the fourth year of education. Optional externships are available during the summer between the third and fourth years in many of the more traditional curricula (Tables 4 and 5).

Table 4—Required internal and externship elective clerkships and optional elective clerkships at United States and Canadian veterinary schools

Institution	Required Weeks				Optional (Weeks)
	Ext	Int	Any	Total	
Auburn	10	7.5	2.5	20	0
California			3*	3*	13
Colorado		12		12	12
Cornell			4	4	4
Florida			10	10	0
Georgia	4			4	8
Guelph	8	8		16	8
Illinois			12	12	12
Iowa			7	7	20
Kansas			15†	15	0
Louisiana		8		8	10
Michigan			14	14	8
Minnesota	4		10	14	4
Mississippi			36	36	6
Missouri				0	32
Montreal	3	3		6	12
N Carolina		4	4	8	8
Ohio			4-9‡	4-9‡	9-4‡
Oklahoma	2§		16§	22§	2
Oregon	8		8	16	8
Pennsylvania				0	16
Pr Ed Island		27	3	30	0
Purdue	6		15	21	2
Saskatchewan			4	4	0
Tennessee		2		2	4
Texas			4	4	0
Tufts			11	11	3
Tuskegee				0	12
Va-Md			6	9	3
Washington			12	12	10
Wisconsin			21	21	5

*Tracking curriculum; varies with the track (see the text); there are three to 11 weeks of "Any" electives required, varying with the track; this does not include selectives. †Six weeks must be spent in externship or advanced internal clerkship; 9 weeks may be any elective. ‡13 weeks are available for required and optional electives; five credit hours are required, which may take four to nine weeks to complete, depending on the clerkships selected, leaving nine to four optional weeks. §One externship lasting two, four, or six weeks is required, the length of which determines whether the number of weeks of "Any" electives is 20, 18, or 16, respectively, for a total of 22 weeks of required electives.

Ext = Externship/preceptorship; Int = Internal clerkship; Any = Any type of elective; Optional = Time available for vacation or electives, at student's choice, often including the summer between the third and fourth years, when available.

Table 5—Summary of clinical clerkships at United States and Canadian veterinary schools

Institution	Required Weeks						
	Large animal	Small animal	Support, specialty, mixed species, and other	Elective	Total	Optional elective weeks	Grand total weeks
Auburn	15	10.8	14.2	20	60	0	60
California	*	*	4*	3	35	13	48
Colorado	8	8	8	12	36	12	48
Cornell	10	8	10	4	32	4	36
Florida	12	8	20	10	50	0	50
Georgia	14	13	9	4	40	8	48
Guelph	9	5	8	16	38	8	46
Illinois	9	6	12	12	39	12	51
Iowa	10	10	12	7	39	20	59
Kansas	13	12	8	15	48	0	48
Louisiana	10	9	13	8	40	10	50
Michigan	10	10	8	14	42	8	50
Minnesota	12	9	13	14	48	4	52
Mississippi	16	18	14	36	84	6	90
Missouri	20	16	18	0	54	32	86
Montreal	12	4	8	6	30	12	42
North Carolina	12	8	20	8	48	8	56
Ohio	13.33	10	6.67	4-9†	34-39	9-4†	43
Oklahoma	4	8	13	22	47	2	49
Oregon	11	6	7	16	40	8	48
Pennsylvania	10	11	13	0	34	16	50
Pr Ed Island	0‡	0‡	0‡	30	30	0	30
Purdue	0*	0*	2*	21*	48	2	50
Saskatchewan	10	8	10	4	32	0	32
Tennessee	16	8	20	2	46	4	50
Texas	16	16	12	4	48	0	48
Tufts	12	12	14	11	49	3	52
Tuskegee	8	8	16	0	32	12	44
Va-Md	6	6	12	9	48	3	51
Washington	15	10	5	12	42	10	52
Wisconsin	10	4	12	21	47	5	52

*Tracking curriculum, varies with the track. †Thirteen weeks are available for electives; five credit hours are required, which may take four to nine weeks to complete, depending on the clerkships selected. ‡Totally elective, nontracking clerkship curriculum

Exceptions to exclusively fourth-year core primary care clerkships include the following:

Tuskegee University divides each clerkship experience equally between third and fourth years, with the students having one half day of didactics and one half day of clinics each day (*see* Half-day vs full-day clerkships).

The University of Missouri completes didactic exposure after the second year, and then requires seven clerkship blocks of eight weeks each (Tables 1-3), including a two-week vacation period and four blocks of eight weeks each of free time (ie, electives; Table 4) during the subsequent 22 months. Required or elective blocks are randomly assigned throughout the final two years.

Mississippi State University also completes all preclinical didactic exposure by the end of the second year. Students then have 36 weeks of required clerkships during the third year, and 12 weeks during the fourth year (Tables 1-3). In addition, during the fourth year, there are 36 weeks of electives, including up to 12 weeks of externship and the option to repeat any of the core clerkships (Table 4).

Oregon State University does not have a small animal hospital; required small animal clerkships are fulfilled at Washington State University during the Oregon State students' third year (Table 2), including small animal anesthesia (Table 3).

The University of Pennsylvania provides the opportunity for 5 to 10% of third-year students to participate in 8 weeks of clerkships, instead of third- or fourth-quarter elective didactic course work. This is in addition to, not instead of, fourth-year clerkships.

Half-day vs full-day clerkships—All of the clerkships listed for Tuskegee University are fulfilled during one half of each day of the week, plus weekend coverage. Represented in Tables 1-3 is estimated contact time in the clerkships, derived by dividing the number of half-time weeks by two.

Large animal clerkships (Table 1)—All but three schools (California, Purdue, PEI) require large animal clerkships, with the total required weeks varying from four to 20. At 21 of the institutions requiring large animal clerkships, one to four weeks of field service (ambulatory—exclusively or

mainly individual animal problem management) are required (plus Georgia, which offers it as one of a selective). Field service clerkships are listed as large animal at 15 schools (plus Georgia's selective). They are separated by species into food animal and equine only at Auburn; there is a solely equine field service clerkship only at Colorado State, and a solely food animal clerkship at four schools (Florida, Michigan State, Missouri, Oregon State). A clerkship in herd health is required at 9 institutions, and it is one of a selective at Georgia.

The breakdown of in-hospital large animal rotations varies as follows: at 13 schools the clerkships are only general, that is, large animal; at 12, clerkships are separated by species (equine and food animal); and three have general large animal and species-restricted in-hospital clerkships. Theriogenology is a required clerkship at nine institutions (in most instances, this includes small animal exposure) and is one of a selective at Georgia.

Small animal clerkships (Table 2)—Of 31 institutions, 28 (all but California, Purdue, and PEI) have required small animal clerkships. The number of required weeks varies from four to 18. Small animal surgery is not subdivided at 11 of the 28 institutions, whereas it is subdivided into orthopedics and soft tissue surgery at 17. Separate small animal intensive care unit clerkships are required at eight institutions. Emergency medicine clerkships exist at four (plus a nontabulated double shift, which provides for one week of emergency medicine, at Ohio State, and a combined clerkship with outpatient/receiving at Michigan State and Oklahoma State). Outpatient/receiving (variably known as local practice) is a clerkship at 10 institutions, always in conjunction with another clerkship termed internal medicine (or referral practice).

Support, specialty, mixed species, and other clerkships (Table 3)—Only PEI does not require clerkships in this category. Radiology clerkships are required of all students at all institutions except California, PEI, Purdue, Montreal, and Washington State. Specific anesthesia clerkships are required at all except Montreal, PEI, Purdue, and Tuskegee. Twenty-nine of the 31 institutions require anatomic pathology as a separate clerkship or defined subrotation (25 institutions), or as a component of the pathology clerkship (anatomic pathology plus clinical laboratory, four institutions). Separate clinical laboratory clerkships are required at 20 institutions. At two institutions (Washington State, PEI) no clerkship is required in pathology, clinical laboratory, or anatomic pathology. One or more of the specialty clerkships, cardiology, neurology, ophthalmology, and dermatology, is required at 17 institutions. Generally, these are mixed species in nature, although they deal mainly with small animal patients. Microbiology and public health exist as discrete clinical experiences at five institutions each. A variety of types of clerkships are listed under "Other" in Table 3. These include selectives (four institutions), various other laboratory experiences (three institutions), oncology (two institutions), zoo and wildlife (two institutions), and respiratory medicine, pharmacy, and pediatrics/genetics (one institution each).

Electives (Table 4)—All but three (Missouri, Pennsylvania, Tuskegee) of the 31 institutions require students to be involved in elective clerkships, varying in duration from two to 36 weeks. For the 28 schools requiring electives, externships only are required at five, internal clerkships are required at five, and both types are required at three, whereas 15 institutions do not specify the type of elective (ie, "any"). In addition to required electives, optional electives are allowed at 22 of the institutions. They also are allowed at the three institutions not requiring electives. The duration of optional electives varies from two to 32 weeks at the 25 institutions offering them.

Summary of clerkships (Table 5)—The duration of required clinical clerkship exposure varies from 30 (Montreal, PEI) to 84 weeks (Mississippi State). Adding the period available for optional clerkships brings the total length of time available for clerkships to 30 to 90 weeks, the longest being at the two institutions with full-day third- and fourth-year clerkships (Mississippi State, 90; Missouri, 86).

Institutional interactions—Some veterinary schools are interacting on a formal basis in the provision of education to students. For example, Oregon State, which has no small animal hospital, relies on Washington State to provide all required small animal clerkships. The concept of multi-institutional consortia is growing also; these formally expose students to areas of special emphasis/expertise not available at their home institution. One example is the Food Animal Consortium, which is expected to involve 41 students during its second year in 1991/1992. The establishment of the consortium was assisted by planning money provided by the Pew National Veterinary Education Program. It involves the following institutions and areas of special capability: California, large dairy herds kept in confinement, and small ruminants; Florida, dairy and beef cattle kept on pasture throughout the year; Illinois, swine; Kansas State/Nebraska, beef cattle; and Michigan State, small dairy herd operations.

Recently revised clerkship curricula—Three institutions have instituted new clerkship curricula, as represented in the tables, as follows: Auburn and Virginia-Maryland during the 1991/1992 academic year, and California, during 1990/1991. All other current clerkship curricula have been in existence since prior to the 1990/1991 academic year.

Institutions planning changes in their clerkship curriculum

Eighteen schools are planning or considering changes, as follows:

Colorado State University—Colorado State is in the midst of a change of curriculum, which started with the first-year class in 1990. There are definite plans for developing a fourth-year tracking curriculum, to go into effect in May 1993. The current plan is to allow four tracks: Equine, Small Animal, Food Animal, and Nontraditional Medicine. There would be a decrease in the core clerkships required of all students, to six weeks, including two weeks each of anesthesia, radiology, and anatomic pathology. In addition, there would be 20 or 21 weeks of track-specific core clerkships, and 9 or 10 weeks of electives (depending on the track), for a total of 36 weeks of core requirements during the fourth year. This would be exclusive of optional electives during the summer between the third and fourth years.

Cornell University—A move to a 12-month fourth-year curriculum is planned, with a target date for implementation of May 1992. There would be 32 core clerkship weeks (representing an increase from the current curriculum of one week of large animal medicine, one week of anesthesia, one week of small animal internal medicine, and one week of small animal outpatient/receiving), four weeks of externship or internal courses from a selective, and 16 weeks comprising optional electives, which can be fulfilled internal or external to the institution. Cornell is not considering tracking.

University of Florida—There is an ongoing review of the curriculum, including a move toward modified tracking, with a final plan expected by the end of 1991. It is expected that clinical exposure will be expanded into the third year. The target for implementation is the 1992/1993 academic year.

University of Guelph—A new clerkship curriculum has been approved to go into effect in September 1992. It will involve 16 weeks of core discipline clerkships and 14 weeks of electives in the fourth year, and eight weeks of required externships between the third and fourth years. Specific tracks will not be required.

Iowa State University—Curriculum review is ongoing, with a move toward tracking being planned. The faculty has approved a 14-week core requirement for all students, which will include anesthesia, radiology, anatomic pathology, clinical microbiology, intensive care, and emergency medicine clerkships. A further, required tracking component will include at least one species-oriented block, from among Small Animal (12 weeks), Food Animal (8 weeks), or Equine (4 weeks) options. In addition, up to 10 weeks of electives will be available. The change will begin in the summer of 1992. Further, the faculty is considering curricular revisions in which required didactic course time would be cut by as much as 50%. It is anticipated that clinical exposure would be expanded to the first through the third years. Eventually, there is consideration that the third year may look like the current fourth year, whereas the fourth year would involve more advanced studies, to become more like an internship.

Louisiana State University—A review of the curriculum is ongoing, with the likely result to be an increase in electives and a decrease in core. This is estimated to require at least two years to implement, and is likely to involve didactic and clinical clerkship courses.

University of Minnesota—A new curriculum is being developed, with a target for implementation of fall, 1993. As of now, it is conceived that five tracks will be offered, including Small Animal, Mixed Animal, Equine, Food/Production Animal, and Research/Public Practice. In addition, there is consideration of decreasing didactic course work to allow more independent learning, and of expanding clinical exposure into the third year of the curriculum.

University of Missouri—The only planned change is as follows: At present, some of the clinical clerkships include about two hours of didactics per day. In 1993, all such didactic time will be removed from the clerkships and combined to form a separate required didactic block.

University of Montreal—A major curriculum review is ongoing. This likely will be associated with a decrease in core didactics and an increase in clinical exposure. It is presumed that eventually there will be core didactic courses and clerkships, and clinical tracking with core-specific track courses and electives. Fall 1993 is the target for implementation.

The Ohio State University—There is consideration of decreasing core species courses, converting to a semester from a quarter system, increasing free (elective) time, and beginning clinical clerkships in the spring semester of the third year. The latter would allow electives during the last semester of the fourth year. If approved by the faculty, the tentative plan is to phase in the revised curriculum, with the first changes affecting the first-year class during the fall of 1993.

University of Pennsylvania—A draft of an Academic Majors (ie, modified tracking) curriculum is under faculty consideration. Five majors have been identified: Companion Animal; Equine; Food Animal; Biomedical Research; and Specialized (eg, zoo and wildlife, laboratory animal, aquatic animal). There would be a 10 to 20% decrease in required core didactic course work. Further, there would be more elective didactic courses, earlier clinical exposure, and greater flexibility in selecting clerkship experiences.

University of Saskatchewan—A committee is considering a plan to decrease the core and increase the number of electives, with "enrichment

opportunities." There is a plan to implement these changes in the 1992/1993 academic year.

University of Tennessee—There is discussion of moving some clinical exposure of students to the early years of the curriculum, and increasing elective clerkship time in the fourth year. There are also preliminary plans to increase the exposure to problem-oriented/problem-solving courses throughout the curriculum.

Texas A&M University—A new fourth-year curriculum has been developed, with a start date of May 1992. Core rotations will include eight weeks each of small animal clinics and large animal clinics, four weeks of laboratory services, and two weeks each of anesthesiology and radiology. An eight-week reduction in core clinical clerkships would increase the elective period by an equal amount.

Tufts University—A formal curriculum review is ongoing, with no target date for implementing changes. Although specifics are not finalized, a central component likely will be a substantial decrease in the didactic core, with increased availability of time for earlier clinical exposure or involvement in research. Changes in the clerkship curriculum, including bringing clerkships into the third year, are under consideration.

Tuskegee University—A formal curriculum revision is under consideration, with a target date for implementation of fall, 1992. A modified tracking system is proposed, with the fourth year divided into 10 equal blocks over a 12-month period. Seven of the 10 blocks would constitute the core, leaving three blocks dedicated to electives for tracking/emphasis. There would be full-day exposure in the fourth year only, instead of the present half-day exposure during the third and fourth years. There would, however, continue to be one half day per week of exposure to clinics in the third year, as an introduction. The overall content of the core would not change substantially.

Washington State University—A revision of the curriculum is under consideration to decrease the core and increase elective options in didactic and clerkship courses. The target date for implementing the changes is June 1992.

University of Wisconsin—There is some consideration to set aside time in the first three years for clinical exposure and problem solving, in exchange for didactics.

Discussion

For the purposes of this report, we have restricted our attention to clinical clerkships. It deals with undergraduate professional veterinary clinical education in an era of major national movement toward change in all aspects of the professional curriculum. In some cases, the changes have been said to be associated, in part, with involvement in the Pew National Veterinary Education Program[1] (although several institutions indicated that they had been considering changes prior to or outside of the Pew process).

We have observed several trends for modification of clerkship curricula:

First, there is movement toward decreasing core requirements and increasing electives, much in accord with trends in revising didactic, preclinical veterinary curricula.

Second, there seems to be movement toward species tracking. Two institutions (Purdue, California) have formalized full tracking clerkship curricula (a maximum of a few weeks of core support clerkships required of every student—the rest, a mix of track-specific core and selective and elective exposure, varying with the track). Others noted previously are in the process of considering a similar curriculum. Modified tracking is a less restrictive approach to allowing species or other discipline concentration/emphasis in the curriculum. Virginia-Maryland was the first example of such a curriculum, and now some other institutions are considering this approach. This type of curriculum allows students to obtain a base of hands-on knowledge of all domestic species, but to emphasize/enrich exposure to the species or nonpractice track of interest to them at that stage of their education. In PEI's novel, totally elective, clerkship curriculum, there are no formal tracks, but the students are at liberty to arrange their schedules to become functional tracks.

Third, there is a tendency toward extending the period during which clerkships are being offered, for example, by expanding such exposure into the third year of the curriculum, or to a 12-month from a 9-month curriculum. This often is associated with plans to decrease the core didactic curriculum and to allow the option to pursue emphasis in didactic courses and clerkships. Simultaneous with the latter, there is consideration of moving some didactic course work into the current clerkship year(s). Both approaches bring with them a hope that the juxtaposition of related clinical and didactic exposure might render both components more meaningful to the student. That is, by better demonstrating their clinical relevance, basic/didactic principles and facts might be more readily assimilated and retained. On the other hand, Tuskegee, which has full integration of didactics and clinical exposure during the third and fourth years, is considering a more classic separation of clinical and didactic education.

Fourth, several schools are offering emphasis/tracking in nonpractice career development during what otherwise would be the clinical clerkship year. This is associated with expanding niches for veterinarians in biomedical research, governmental, and industrial positions.

We will now comment on the trend toward

tracking clerkship curricula. First let us consider the full tracking curriculum, which allows students the ability to choose their clinical clerkship curriculum from a number of species-related or nonpractice choices. Although most students may opt for general, multispecies exposure, full tracking allows students to choose never to have hands-on clinical exposure to more than one or a few species.

Many arguments against the full tracking clerkship curriculum have been based on the fact that those who choose a species track restrict their hands-on clinical knowledge base:

- Full tracking, for those students who take a restrictive option, greatly diminishes one of the fundamental strengths of a general undergraduate veterinary education, that is, the production of comparative clinician/scientists. This sets us apart from our medical colleagues when we choose to perform research, especially in regard to knowledge of and experience with various animal species that may serve as models of human disease. First-hand knowledge of the similarities and differences between species makes us better clinicians and biomedical scientists than would otherwise be the case.
- Limited licensure is a potential eventual result of full tracking.
- Restricted hands-on animal experience with one or a limited class of species renders changes in professional employment directions more difficult, because of a lack of knowledge (possibly requiring additional formal training) and the potential need to be subjected to a new licensing examination. The limited degree of exposure to multiple species during a traditional veterinary curriculum provides the student with more first-hand clinical knowledge with which to decide on career options, and this background provides greater self-assurance, to render more feasible a decision to change veterinary disciplines even late after graduation.
- Students may not have enough information to critically select a restricted curriculum at their stage of education, with potentially negative effects if they decide to change their direction even shortly after graduation.

Those in favor of tracking[a] counter that:

- All students receive didactic education in all species during the preclinical years of a tracking curriculum, so they are provided with the knowledge base needed if an eventual change in career within the profession is desired.
- Students in all tracks are exposed to the fundamentals of surgery and medicine during exposure to their species of interest. This is adequate as a base for entry-level skills, to allow easy shifting of clinical species specialization after graduation.
- In the future, additional clinical training essentially will be required of individuals seeking to change their species specialty, regardless of their species exposure during their professional education. This will be dictated by increasingly sophisticated clients and the litigious nature of United States society. Further, exposure of students to several weeks of hands-on clinical training during their professional education does not provide any long-lasting clinical skills in a given species unless graduates continue to use that knowledge.
- A student may be assisted in making an informed choice about tracking, by providing appropriate course work prior to the decision. At Purdue, for example, this includes a course on "Careers in Veterinary Medicine" in the preveterinary curriculum, orientation sessions on veterinary careers and clinical tracking in years 2 and 3 of the veterinary curriculum, and assignment of faculty advisors to third- and fourth-year veterinary students, to assist them in their decision and its implementation.
- Tracking can facilitate expanding the spectrum of career options available to graduating veterinarians, by allowing students to be trained for access to emerging professional niches, for example, government, industrial and biomedical research options (in the Nonpractice track).

Even given these responses, we remain to be convinced about the propriety of full tracking curricula. It is our opinion that some form of modified tracking (core plus emphasis components) makes more educational sense. This approach is analogous to the time-honored undergraduate majoring in history, biology, and similar subjects. Thereby, all students have a basic curriculum, enriched via the subject matter of the major. It is noteworthy that the University of Pennsylvania is planning to use this terminology, rather than tracking or emphasis, as it alters its curriculum. Modified tracking/majoring would appear to fulfill the societal need to have better trained entry-level clinicians in their chosen species or other specialty at the time of graduation, than is possible with a completely general, multiple-species curriculum. Further, modified tracking would not have the previously mentioned possible negative attributes of the full tracking curriculum.

An alternative to the Virginia-Maryland modified tracking curriculum is to have a restricted core and allow a substantial amount of elective time. In this model, students can select those clerkships they wish to emphasize, without a formal tracking structure, but with adequate faculty advice to allow an informed selection of the emphasis courses. This would be, essentially, a blend of the PEI and Virginia-Maryland curricula. As may be observed from the summary of plans presented previously, many of the veterinary schools appear to be selecting this approach, in preference to formal tracking.

[a] J. F. Van Vleet, Purdue University, West Lafayette, Ind, and G. H. Cardinet, University of California, Davis, Calif. Personal communication, 1991.

The further development of formal interinstitutional educational programs is to be commended, including regional or national veterinary educational consortia, similar to the Food Animal Consortium described already. This educational approach allows access by students to programs not available or inadequate for their purposes at their home institution.

For consortia to succeed, institutions may have to modify how they compete for students. That is, whereas now they may emphasize their relative academic or programmatic strengths, compared with other schools, this may not be as possible in a consortium arrangement. This could be a difficult problem in these days of more student slots and fewer applicants.

Through consortia, veterinary educational institutions could take advantage of unusual, expensive, and sometimes unique areas of faculty expertise, caseload characteristics, and equipment and facilities at other institutions. This would allow institutions to more readily accept that they do not have to be all things to all students. Consortia could increase the quality and efficiency of education and decrease the cost, a service to our students.

There appear to be as many experiments in professional veterinary education as there are educational institutions. The interesting thing is that all the approaches seem to work, as judged by the quality of our graduates. Perhaps it is the quality and enthusiasm of the student that is a greater determinant of the outcome of education than the attributes of a specific curriculum. This may be particularly true because of the generally high quality of United States and Canadian schools. The near future should be an interesting period in veterinary education. We might well see some of the noted trends develop into more defined national or international directions in curriculum reform.

References

1. Pritchard WR, ed. *Future directions for veterinary medicine*. Durham, NC: Pew National Veterinary Education Program, 1989.

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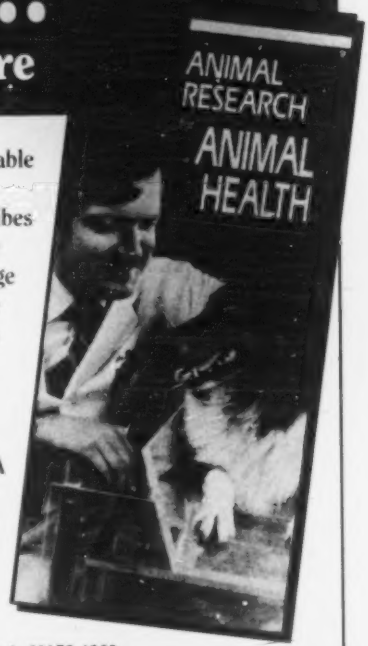

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